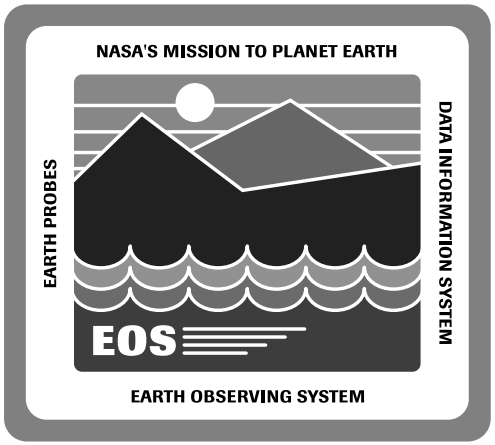
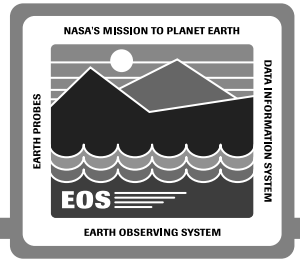


System Integration & Test

Gil Scott

System Design Review - 29 June 1994

Agenda



Verification Goals

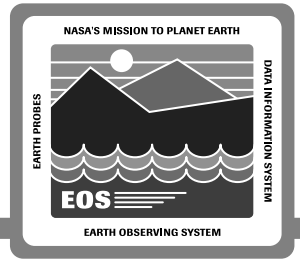
Impact of the ECS Design on Verification

Verification Program Summary

User Involvement

Status & Roadmap

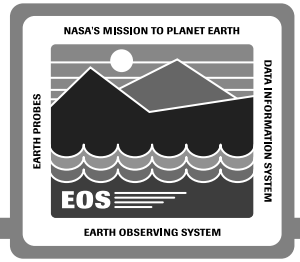
Verification Goals



Field a Working ECS That:

- **Satisfies Baselined Requirements**
  - **Verify IRDs and Level 3 Requirements**
  - **Traceability Assures that all requirements are verified - RTM Tool**
- **Is Ready for Integration**
  - **External interfaces are tested/verified**
    - **Early Engineering-level Testing with Outside Systems**
    - **Formal Test with Simulators or Actual Interfaces**
  - **System Installed at Sites - Site-Site Interfaces Verified**
    - **Hardware Acceptance is Performed**
- **Fulfills User Needs**
  - **Verification Above Unit Level is Driven by User Scenarios**
  - **Segment I&T Focuses on Small Portions of a Scenario - A Thread**
  - **System I&T Focuses on Longer Threads**
  - **Acceptance Testing Uses Actual User/OPS Scenarios**
- **Provides Representative Sample of Real Data to Support Testing**

Impact of the ECS Design on Verification

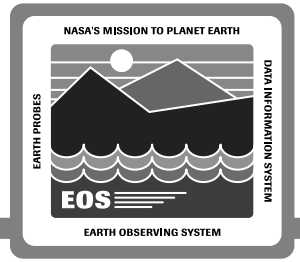


Flight System Architecture Largely Unchanged - No New Verification Focus

Response: Continued Recognition of Criticality of Flight System

- **Protect Space Resources & Maximize Science Collection**
- **Rigorous Formal Test Program**
  - **Multiple Independent Test Activities**
  - **Careful Traceability to Insure Complete Coverage**

Impact of the ECS Design on Verification



Science System Now a Federated, Distributed System

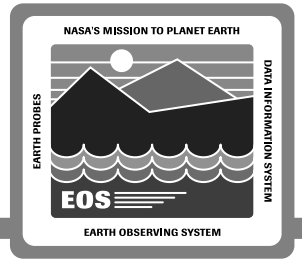
- **Service Advertising/Brokering Paradigm Means Flows Through System are More Dynamic**
- **Architectural Decisions Require Much Leading Edge Technology Insertion via COTS**
- **ECS Delivers Both Components and a Configured Instance of Them**

Response: Evolve the Science System Testing to Fit New Realities

- **Recognize Criticalities to Rightsize Testing Effort**
- **Emphasize Interface Testing Because Configurations are Fluid**
- **Test Components (Objects) for Services Provided**
- **Verify Delivered System Meets Mission Requirements**

BUT, Remember That the System MUST WORK

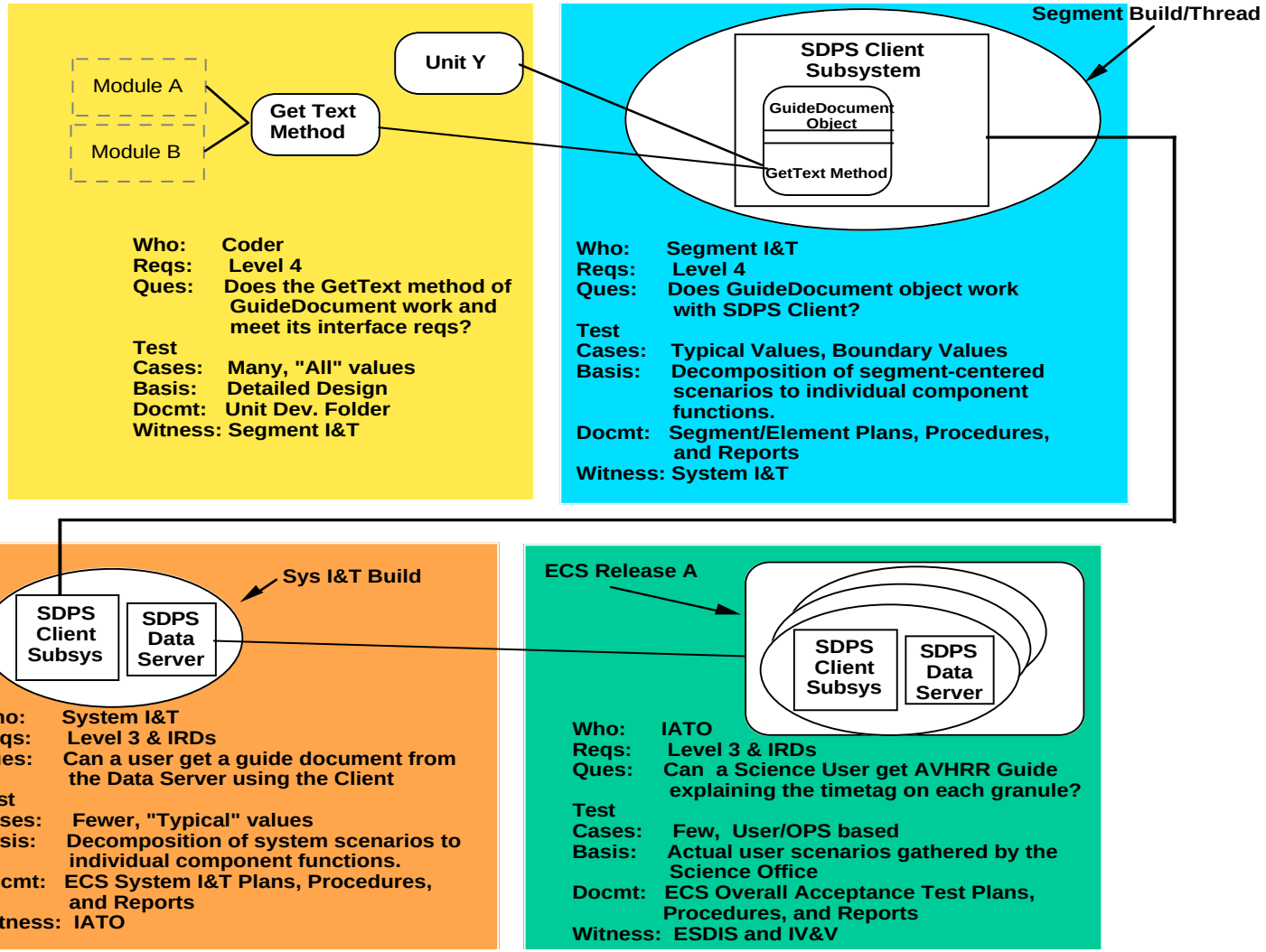
Verification Program Summary



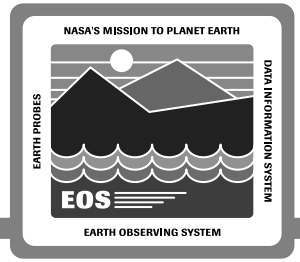
The ECS Verification Program is a Progressive Group of Activities That:

- **Are Performed by Developers, Segment I&T, System I&T and the IATO**
- **Examine Larger and Larger Parts of the System**
- **Are Requirements Driven, But Approach from Different Points-of-View**
- **Are Appropriate to the Criticality of the Function Under Test**
- **Are Witnessed by Different Groups**
- **Are Described in a Progression of Documents**

Test Progression Example



User Involvement



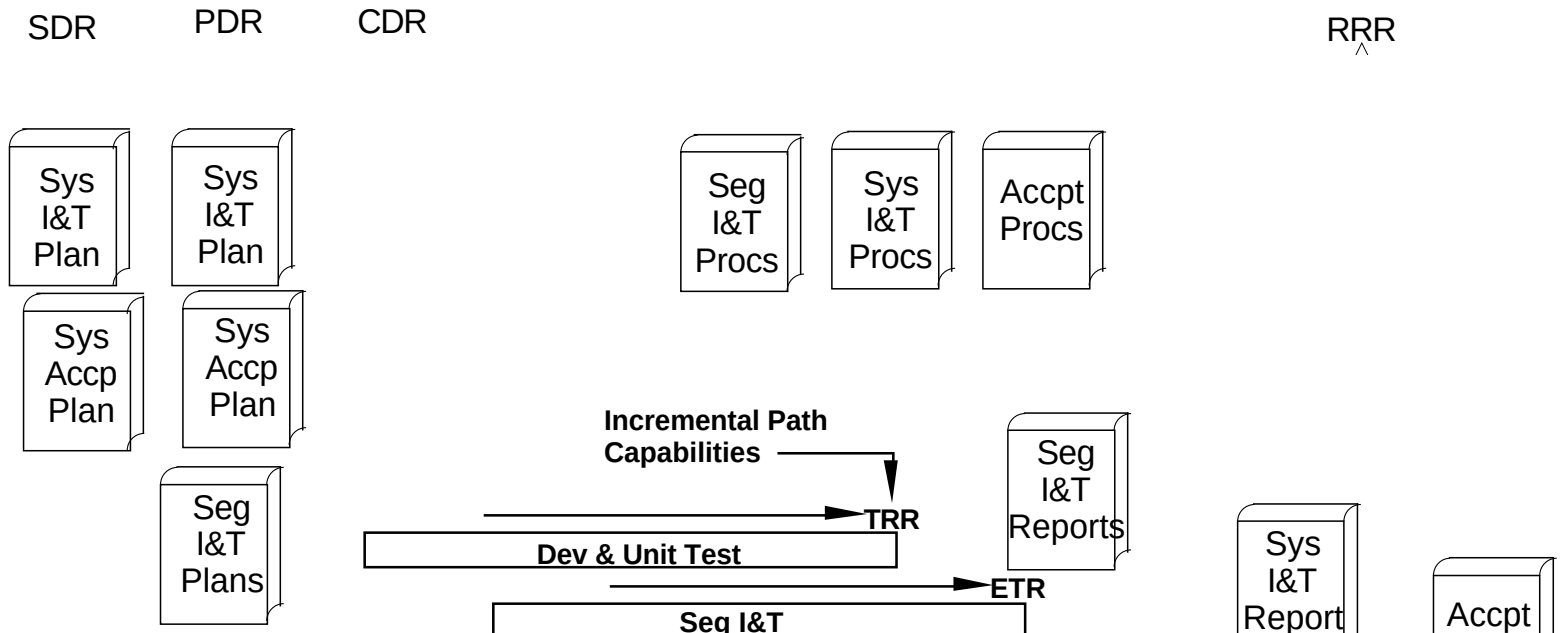
It is Recognized that:

- **The Ultimate System Must Support Users & Operations Personnel**
- **Requirements in Isolation Often Don't Capture those Needs**
- **Without Understanding Those Needs, Verification Is Incomplete**

Mitigation:

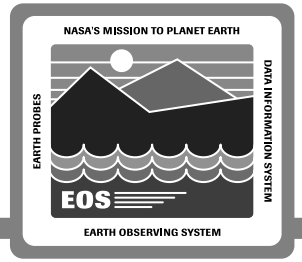
- **Typical Scenarios are Source of Build/Thread Decomposition**
- **Acceptance Test Based on User & OPs Scenarios**
- **Participation**
  - **User Review of Plans & Procedures**
  - **Incorporate ECS Tirekickers and M&O Personnel as Operators in Tests**
  - **Intend to Schedule Beat-and-Bash Sessions During Preparation**

Status - Roadmap



Legend:
TRR Test Readiness Review
ETR Element Test Review
CSR Consent to Ship Review
RRR Release Readiness Review

Definitions
(Background Information)



Verification **assures through test, demonstration, inspection or analysis that the delivered system meets requirements.**

Scenarios **are a series of actions that are performed (or occur) to accomplish an overall user or operational goal.**

Threads **are decompositions of scenarios into smaller, more manageable series of actions.**

A *Software Thread* is the group of software components necessary to perform a thread.

A *Software Build* is an integrated collection of software threads.

Release A Build/Thread Diagram